

Lifetime measurement of electron-hole pairs in multi-crystalline solar cells for terrestrial applications

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A thesis submitted in partial fulfilment for the degree of Master of Science in Physics in the
Jomo Kenyatta University Of
Agriculture and Technology

2006

ABSTRACT

In this research work, the Si-polycrystalline solar cell has been characterized with the objective of studying in details the lifetime of electron-hole pairs (ehp). The polycrystalline materials are composed of a number of single crystals oriented at random and separated by "grain boundaries". The operating characteristic of the Si- polycrystalline based solar cells is dictated, in large part, by the characteristics of the grain boundaries. This interaction at the crystal boundaries within the solar cell is poorly understood. Therefore the need to study the recombination lifetime for the electron-hole pairs is paramount from the recombination current obtained from the current verses voltage ($I - V$) curve when the ideality factor is 2. The device perimeter to area ratio given is calculated from the measurement. These measurements were obtained from the mesa structures of the following dimensions 5cmx5cm, 6cmx6cm, 7cmx7cm, 8cmx8cm, 9cmx9cm and 10cmx10cm. The Si-polycrystalline solar cells are the most commonly used in this country. This therefore necessitate a simpler way of determining the lifetime and hence the efficiency of the solar cell. The current is measured under dark. The calculated value of lifetime from results was found to be 5.21 μ s. This is comparable with lifetime determined by other techniques in the solar materials applied in terrestrial use.